The WATER and SANITATION SYSTEMS UPGRADE PROJECT
A Lifetime of Water

The delivery of piped water goes as far back as the 1850’s when the water supply in Barbados was provided by a privately-owned company known as the Bridgetown Waterworks Company which was founded in 1857. In 1886, a second privately-owned company by the name of Barbados Water Supply Company was formed whose source of water was Everton in St. John next to the Bridgetown Waterwork’s Company’s well at Bowmanston. (See Figure 1).

By the early 1890’s these two companies had conflicts over the Bowmanston/Everton Catchment therefore the government made the decision to buy out the shareholders to form the Barbados Waterworks Department in 1895 which subsequently became the Barbados Water Authority (BWA) in 1980 (Act, CAP 274A, 1980).

However, it was not until 1st April of 1981 that the company operated under the name the Barbados Water Authority. The BWA is a government-owned statutory corporation and is responsible for managing, allocating and monitoring the water resources of the island with the view to ensuring their best development, utilization, conservation and protection in the public interest.

It is also responsible for the designing, construction, acquisition, provision, operation and maintenance of water and sewerage works for the purpose of supplying water for public purposes and the receiving, treating and disposing of sewage, respectively. Though the water system is island-wide, the sewerage works are two centralized systems located in Bridgetown and the South Coast.
The BWA extracts its water from aquifers through twenty (20) groundwater wells across the island. This water accumulates as a result of rain water percolating through limestone \( \text{(see figure 2)} \). With this geological make up, the BWA only needs to chlorinate water before distributing it to its customers. The BWA also sources water from two (2) springs and purchases the remaining supply from the privately-owned desalination plant, Ionics Freshwater Ltd.

**Figure 2** - An illustration of how water is pumped to your home.
The Rationale of The Project

The Government of Barbados received a fifty million US dollar (US$50M) loan from the Inter-American Development Bank (IDB) for a Project to address the following major challenges facing the BWA:

- Organisational and operational inefficiencies;
- The current groundwater abstractions exceeds the sustainable groundwater yields;
- High Non-Revenue Water (NRW) which is estimated at forty-nine percent (49%) of the water produced;
- A high annual energy cost of approximately thirteen million US dollars (US$13M);

This project is known as the Water and Sanitation Systems Upgrade Project (WSSU) which is being executed by the Project Execution Unit (PEU) in order to achieve the following:

- A modernised and institutionally strengthened water and sanitation sector;
- The preparation of the BWA for regulation by the Fair Trading commission;
- An improvement of the BWA’s financial position and viability as a commercially run company;
- An improvement in the water delivery infrastructure and the efficiency of the BWA’s operations, resulting in at least a ten percent (10%) reduction of NRW;
- The reduction of energy costs of the BWA by at least five percent (5%);
- The improvement of the water production infrastructure which will result in the provision of high quality service and product through improved efficiencies;
- The improvement of the wastewater treatment plants’ infrastructure.
Taking the BWA to Extraordinary Heights

... through Customer Satisfaction.

- **Reorganization and Modernization**
  The BWA through its Long Term Business Plan and an Improvement Plan for Long Term Customer Service will commit itself to continuous training and development of its staff to provide high customer service. In addition, the acquisition and implementation of Management Information Systems (MIS) across the BWA will contribute significantly to improving customer service.

- **Resolution of Turbidity Problems at Bowmanston** –
  It is well known that after heavy or consistent rainfall, the water in the Bowmanston well becomes turbid or muddy. Thus, the BWA will be carrying out remedial works and upgrades to this station in an effort to address this issue.

- **Resolution of Malodours at the South Coast Sewage Treatment Plant (SCSTP)** –
  From time to time customers in the community near to the SCSTP express concerns regarding odour. As part of the Project, the BWA will be addressing this issue through improvements or replacement of the current odour control system.

- **Upgrade of Hardware Infrastructure** –
  In order to achieve these extraordinary heights, the BWA will upgrade its computer hardware systems (laptops, desktops, scanners and high-speed printers), use a combination of virtual and physical servers for their common repository applications and data, as well as purchase safety equipment to protect this infrastructure (smoke detectors and fire suppressant systems).
...through Technological Advances.

**Geographic Information System (GIS)** — This is a computer system for capturing, storing, checking, and displaying data related to positions on the Earth’s surface on one map. It can be used to view, understand, question, interpret, and visualize data in many ways that reveal relationships, patterns and trends in the form of maps, globes, reports, and charts. A BWA GIS map will include information such as the location of water courses, sewage network, land usage, population density and the different types of soil, which can all be used to assist in determining proper sanitation disposal as it relates to areas near water sources.

**Enterprise Document Management System (EDMS)** — The Barbados Water Authority’s EDMS or Electronic Document Management System will enable the organization to transform from a paper-based system to an electronic-based document handling system for the management of all of its documents. This is a more efficient and comprehensive solution for managing information and the records of the BWA.

**Supervisory Control and Data Acquisition (SCADA)** — The implementation of SCADA will allow the BWA through the use of modern day technology to monitor and control its production systems (e.g. pump status, reservoir levels, power and water quality). This also allows the BWA to be more proactive in its operations due to a real-time awareness of potential equipment failure and to respond quickly to issues facing the public. SCADA is critical in assisting the BWA in achieving its energy reduction cost. For example, having real-time data on reservoir levels, will allow the BWA to slow down or stop the respective pump(s) to avoid overflow and wasted energy *(see figure 3).*

![Figure 3 - SCADA technology will improve the BWA’s ability to monitor and control its production systems.](image-url)
Hydraulic Network Modelling – This is a digital replica of our distribution network (pipe network) which will be used to enable it to better manage our operating systems via computer modelling simulations. This will also allow the BWA to plan and evaluate various distribution scenarios which will make it more proactive, efficient and effective in serving its customers. In addition, through the use of this model, the BWA was able to identify the top-ranked critical mains for replacement from which the forty-nine (49) km were chosen. (See Figure 4)
Barbados has been designated a water scarce country. As a result, the BWA will undertake a number of activities to reduce its NRW from forty-nine percent (49%) to thirty-nine percent (39%) by the completion of the Project. NRW is categorized as - **Unbilled authorized consumption** (E.g. stand-pipes fire service); **Apparent losses** - (inaccurate meters/readings or theft); **Real losses** - (leaks on transmission and/or distribution mains and service connections up to the meter; or leaking or overflowing reservoirs).

*(see figure 5)*

<table>
<thead>
<tr>
<th>System Input Volume</th>
<th>Authorized Consumption</th>
<th>Billed Authorized Consumption</th>
<th>Billed metered consumption (including water exported)</th>
<th>Revenue Water</th>
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<td>Unbilled Authorized Consumption</td>
<td>Unbilled Metered Consumption</td>
<td>Unbilled Unmetered Consumption</td>
<td>Non Revenue Water</td>
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<td></td>
<td>Apparent Losses</td>
<td>Unauthorized Consumption</td>
<td>Customer Metering Inaccuracies</td>
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<td></td>
<td>Real Losses</td>
<td>Leakage on Transmission and/or Distribution Mains</td>
<td>Leakage and Overflows at Storage Tanks</td>
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<td></td>
<td></td>
<td>Leakage on Service Connections up to point of customer metering</td>
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*Figure 5 – the BWA will reduce its Non-Revenue Water (NRW) by ten percent.*
The Reduction of Non-Revenue Water (NRW) (con’t)

Over the years, the mains and meters have become worn and aged and therefore one hundred and four thousand water meters 104,000 meters, forty nine (49) km of major transmission mains and seventy-five (75) production meters will be replaced across the island in an effort to achieve the ten percent (10%) reduction in NRW.

Commercial and residential meter replacement – The current meters will be replaced with non-moving parts meters. These meters are more reliable and accurate. Barbados will be the only country in the Caribbean to move to all non-moving parts meters.

Transmission mains replacement – With some mains over 100 years old, there is a drastic need for replacement. Under this project, forty-nine (49) kilometres (km) of major transmission mains which are made of ductile and cast iron will be replaced with PVC (Polyvinyl Chloride) and HDPE (High-Density Polyethylene) mains. (See Figure 6)

Replacement of Production Meters – Seventy-five (75) production meters will be replaced by non-moving parts meters in an effort to accurately measure the water that is produced in order to determine our NRW percentage.
The Reduction of Energy Costs

Due to the high and therefore unsustainable energy bill, the BWA saw it prudent to hire the private consulting firm Econoler to conduct an energy assessment of its operations. The general objective of this consultancy was to provide the BWA with an action plan to increase energy efficiency. This mandate also aimed to develop a general methodology to assist the BWA in self-assessing the efficiency of its installations (both water and wastewater), and thereby identify and adopt the best available technologies and practices. The specific objective is to provide the BWA with the most economic and efficient source(s) of primary energy and standby power to improve supply-side energy efficiency and reduce its energy costs as well as to make recommendations with respect to solutions for the installation of the most economical and efficient sources of primary and standby power.

To achieve the five percent (5%) reduction in energy costs, the following will be executed:

- The purchasing of one hundred and twenty four (124) Variable Frequency Drives (VFDs) and forty-six (46) premium efficiency pumps for water and wastewater.

- The purchasing of three (3) Blowers with state-of-the-art technology. Wherever Blowers are required in the treatment of wastewater, these are the highest energy consumers of all the equipment used in this process.

- The purchasing of a 150 kW photovoltaic (solar) system which will be installed at the Bridgetown Sewage Treatment Plant.

- The BWA will purchase one standby generator and retrofit one prime generator as sources of alternative energy.

Figure 7 – Solar energy (PV) will form part of the plan for the BWA to reduce energy costs by five per cent.
Thanks to our customers...

The Barbados Water Authority thanks the public for its understanding, patience and confidence as we take the Project forward to the benefit of all Barbadians. The BWA also looks forward to meeting with you as we come out to your neighbourhoods to discuss the Project.

For further information on the project please contact:

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